

What is claimed is:

1. A filter cartridge comprising:
  - (a) first and second, opposite, ends;
    - (i) the first end having an air flow exit aperture therethrough;
  - (b) filter media extending between the first and second ends;
  - (c) outer framework having a sidewall structure circumscribing the media at least at a location adjacent the first end and having an outer surface; the outer framework including an air permeable portion in the sidewall structure of the outer framework; and,
  - (d) a first member of a non-continuously threaded, rotational engagement mechanism positioned adjacent to, and spaced from, the first end; and,
  - (e) an axial seal ring on the first end and circumscribing the air flow exit aperture.
2. A filter cartridge according to claim 1 wherein:
  - (a) the first member of a non-continuously threaded, rotational engagement mechanism is positioned on an outer surface of the outer framework, integral with a remainder of the outer framework.
3. A filter cartridge according to claim 2 wherein:
  - (a) the outer framework extends completely between the filter cartridge first and second ends.
4. A filter cartridge according to claim 3 wherein:
  - (a) the first end includes a first, molded, end cap and the axial seal ring is an integrally molded portion of the first, molded, end cap.
5. A filter cartridge according to claim 4 wherein:
  - (a) the first end cap and seal ring comprise foamed polyurethane having a hardness, Shore A, of no greater than 30.

6. A filter cartridge according to claim 2 wherein:
  - (a) the first member of a rotational engagement mechanism on the outer surface of the outer framework comprises a segmented ring.
7. A filter cartridge according to claim 6 wherein:
  - (a) each segment, of the segmented ring, has first and second opposite ends with:
    - (i) the first end of each segment having a tip; and
    - (ii) the second end of each segment, of the segmented ring, having a stop.
8. A filter cartridge according to claim 6 wherein:
  - (a) each ring segment has a cammed surface on a side thereof facing toward said second end cap.
9. A filter cartridge according to claim 1 wherein:
  - (a) said outer framework extends from said first end to said second end and includes:
    - (i) an imperforate shield section adjacent said first end and extending over an axial distance of at least 10% of the axial length of the outer framework; and,
    - (ii) a perforate section having an open area of at least 50% extending between the shield section and the second end; the perforate section having an axial length of at least 20% of the axial length of the outer framework.
10. A filter cartridge according to claim 9 wherein:

- (a) the perforate section of the outer framework having an open area of at least 50% comprises a plurality of axial strips interconnected by a spiral, radial, structure.
- 11. A filter cartridge according to claim 1 wherein:
  - (a) the outer framework comprises a molded plastic member extending between the first and second ends; and includes:
    - (i) a first, open, end embedded within a first end cap potting and defining an air flow outlet aperture; and
    - (ii) a second end embedded within a second end cap potting and including:
      - (A) a central, imperforate end region; and,
      - (B) an outer, annular, perforate, region surrounding the central, imperforate, region;
        - (1) the annular perforate, region being embedded in, and closed by, the second end cap potting; and
        - (2) at least a central portion of the central, imperforate, region not being embedded in the second end cap potting.
- 12. A filter cartridge according to claim 10 wherein:
  - (a) the second end has an outer axial, central, surface with central recess therein.
- 13. A filter cartridge according to claim 12 wherein:
  - (a) said central recess in non-circularly shaped.
- 14. A filter cartridge according to claim 13 wherein:
  - (a) said central recess is plus shaped.
- 15. A filter cartridge according to claim 1 wherein:

- (a) the outer framework has a conical shaped portion with a portion adjacent the first end having an outer diameter D1 and a portion adjacent the second end having an outer diameter D2, wherein:  
D1 > D2.
- 16. A filter cartridge according to claim 15 wherein:
  - (a) D1 is at least 10% larger than D2.
- 17. A filter cartridge according to claim 15 wherein:
  - (a) the conical portion of the outer framework has a conical angle within the range of 1° to 4°.
- 18. An air cleaner assembly comprising:
  - (a) a housing having a sidewall and first and second opposite ends;
    - (i) the first end being closed and having an axial outlet tube therein;
    - (ii) the housing including a dust drop tube adjacent the first end;
    - (iii) the housing including a side air flow inlet adjacent the second end;
    - (iv) the housing sidewall second end being an open end; and,
    - (v) the housing having an end cover removably mounted to close the housing second end; the end cover being a completely closed end cover and having a precleaner comprising a shield having a spiral ramp on an outer surface thereof; the precleaner being positioned to operably receive air from the said air flow inlet, in use.
- 19. An air cleaner assembly according to claim 18 including:
  - (a) a conical, removable and replaceable, primary filter cartridge positioned therein with:
    - (i) a larger diameter end of the primary filter cartridge sealed to the housing, at a location around the air flow outlet, by an axial seal; and,

- (ii) with a narrow end of the primary filter cartridge surrounded by the precleaner.

20. A method of manufacturing a filter element including a step of:
- (a) inserting pleated media into an open first end of a molded plastic, conical, support structure, until the media engages open framework extending across an opposite, second, end of the support structure; and,
  - (b) potting the second end of the support structure in a foamed polyurethane.